Gas Journal

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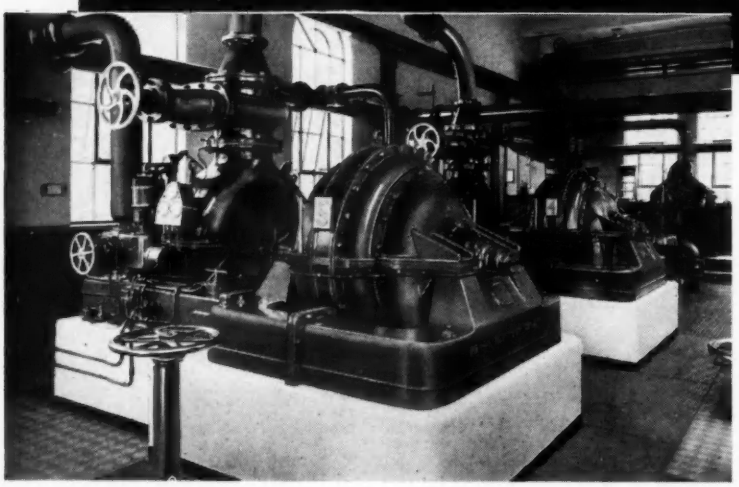

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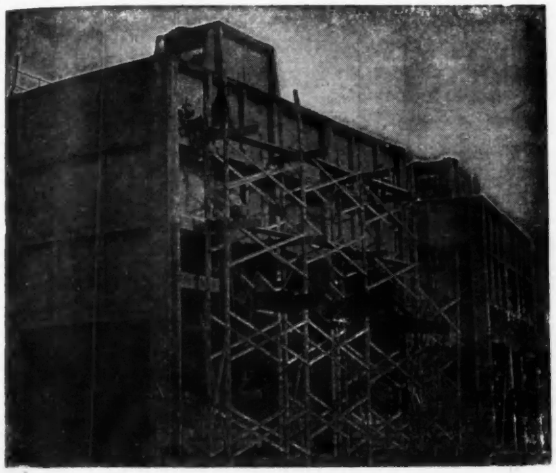

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Gas Journal

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110TH YEAR

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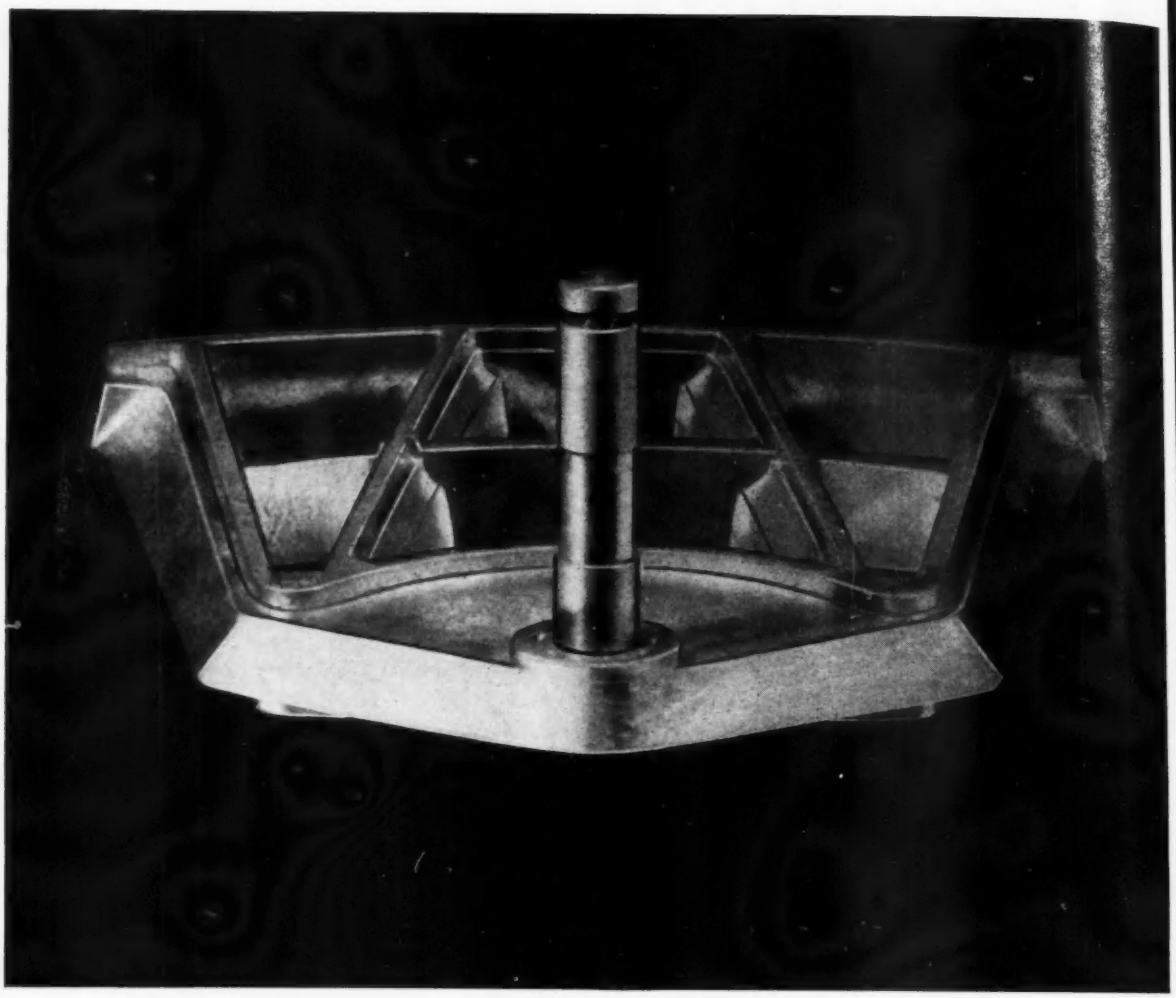

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Gas Journal

VOLUME 296. No. 4974 NOVEMBER 12, 1958. 110th YEAR

Grid Supplies from Coke Ovens

IT is at this time of the year that the two sister carbonising industries come together to discuss their mutual problems in the supply and reception of surplus coke oven gas. These joint meetings are an excellent opportunity for the coke oven manager and the gas engineer to get together on common ground instead of glowering at each other across an imaginary coke-works boundary fence and shaking their fists out of sheer frustration at being unable to understand each other's point of view.

At the annual joint meeting of the I.G.E., the Coke Oven Managers' Association and the British Coke Research Association held last week at the Institution of Civil Engineers, a paper was presented, entitled 'Development and Co-ordination of Gas Grid Supplies from an Integrated Steel Works' by Messrs. J. T. Davies, W. F. Edwards, W. D. Rees and H. J. Victory. This somewhat formidable team of authors, which might be said to represent the four most important points of view influencing the supply of coke oven gas to the industry, produced a detailed but balanced account of how large quantities of coke oven gas can be successfully supplied as both base and main load to an extensive grid system. Mr. Davies, as Chief Fuel Technologist to the Steel Company of Wales, was clearly concerned with how a large coke oven plant can efficiently provide fuel both to the iron and steel making sections of his company and to the Wales Gas Board. The history of the project and the Board's long-standing relationship with the Company were ably dealt with by Mr. Edwards, General Manager of the Aberavon (Port Talbot) undertaking. While Mr. Rees as gas engineer at the Aberavon works and Mr. Victory as coke oven manager at the Margam works, Port Talbot, put forward the technologists' point of view and showed some of the difficulties which have to be faced in day to day working.

The Western and Central sections of the South Wales gas grid will soon be completed. The main supply of gas for an area stretching from Mid-Glamorgan in the East to Cardigan Bay in the West and the Bristol Channel to Lampeter in the North is now being taken from the Margam coke oven works. Peak load or emergency c.w.g. plants situated at Aberavon, Swansea and Neath works are available when needed, and so are a butane plant at Aberavon and methane drainage from nearby collieries, but the coke oven gas and the blast furnace gas from the steelworks constitute the main supply.

Dependence on an outside source for the greater part of all gas entering an extensive grid system might appear to the gas engineer to be something of a risk, but in this case co-ordination between the Wales Gas Board and the Steel Company of Wales is complete. How has this been so successfully accomplished? There would seem to be three main reasons: The first is that the output of gas from the Margam works is so large that the demands of the Board only amount to some 30% of it; secondly, the Board's load has been integrated into the general fuel needs of the steel works itself; and thirdly, there is complete co-operation and understanding of the individual needs and problems of each party. It would be fair to say that without co-operation of this kind and without the presence of a large steel works' coke oven plant conveniently to hand, the supply of gas in this part of Great Britain would have suffered some very severe strains in the last ten years. Since the last war, industry in South Wales has undergone a most profound change, and has left behind a complete dependence on the coal and iron trades.

In the last ten or 20 years the introduction of other industries has resulted in a marked increase in prosperity throughout the Principality. The old pattern of a multiplicity of small gasworks would never have been able to cope with the increasing demands which would have faced it.

The choices open to the Wales Gas Board were either to supply gas from large suitably placed gasworks which in many cases would have to be built, or to rely on all other existing sources. It has chosen the latter and by linking up a number of small remote country districts is successfully supplying them with coke oven gas at a reasonable price. The Board is also carrying out a service, unique in this country, of transmitting large quantities of unpurified gas from Margam to the

Steel Company of Wales' cold reduction plants at Trostre and Velindre, a task which the company would otherwise have to do for itself at greater cost.

The problem which is continually facing the supplier of coke oven gas to an area board, is how to overcome differences in seasonal demand and the drop at week-ends in the industrial load caused by the five day week. All the coke oven batteries at Margam are capable of being underfired by either rich gas or producer gas—in this case blast furnace gas—so that considerable differences in demand for coke oven gas can be met, but in a thermally integrated steel works the various heat treatment processes can be fired by various fuels. This is an advantage which the colliery-based coke oven plant cannot enjoy, instead it must confine its outlets of surplus gas to area boards, steam raising and flaring. Although the gas storage capacity at Margam was considerably increased when the last extensions to the coke ovens were planned, changes in gas demand can be so great in the steel works itself that the only effective form of fuel storage is the provision of alternate liquid fuels. A quick change from gas to oil and *vice versa*, can be made for dual-fuel compressors and tar or fuel oil can be used for reheating furnaces as an alternate fuel to gaseous firing. A very rigid central control of fuel utilisation throughout the steel works ensures that the best use of available fuel is made without flaring large volumes of gas to waste, thereby enabling variations in demand by the Wales Gas Board to be absorbed. Underground gas storage was suggested by one speaker at the discussion that followed, and indeed, if the developments now being carried out in this country and abroad are successful, this may well make oil storage and the use of oil in the steel works unnecessary.

In the meantime, however, the smooth working between the two parties at Port Talbot is a great step forward in making ever greater use of our indigenous fuel resources and in increasing our national fuel efficiency.

Future Fuel Prospects

SEVERAL hints concerning the future pattern of fuel in this country were given at a three-day conference on fuel and power in British industry, organised by the Manchester Joint Research Council in the Manchester College of Science and Technology. Heading the list of speakers, appropriately enough, was the Minister of Power, who said it was reasonable to expect that by 1965 the United Kingdom's fuel consumption would have risen to about 300 mill. tons of coal equivalent a year, compared with the present figure of about 250 mill. tons. Within that total consumption he expected to see no marked change in the pattern of fuel and power use. 'While I should expect the total consumption of coal to increase above the present abnormally low level,' he said, 'we cannot expect it to be the main contribution to the increase in energy needs as a whole.' There would probably be a continued switch from the direct use of coal by consumers to its application in more refined forms, like gas and electricity. Greater refinement in fuel and power use meant heavy capital investments, but it yielded great savings in operating and fuel costs, and avoidance of dirt.

Lord Mills expected a more rapid increase in the use of oil. That would reflect continued expansion of road transport, the re-equipment of the railways, the continuance of recent trends in domestic heating, and the switch from solid fuel to oil in those industrial and commercial uses where it had special attractions. There would certainly be a rapid expansion of nuclear power. The Minister said that it was often argued that the Government should direct what fuel should be used for specific purposes. 'We should certainly hesitate to adopt such a policy of Government direction on fuel use for two main reasons,' he added. The first was that a detailed policy of control would not really work; there was so much uncertainty about which fuel was best used in particular conditions. Secondly, if there was one thing which central control lacked, it was flexibility. A pattern laid down as appropriate at a particular time might quickly become obsolete and uneconomic.

We have often speculated upon the nature of the present Government's fuel policy. On this occasion Lord Mills summed it up as letting the consumer decide what he wanted for his particular needs, and trying to help him make an enlightened choice.

Inevitably this makes one think of our own industry, and it is pleasant to record the fact that the Chairman of the Gas Council stated the case for gas with his customary lucidity. Remarking that the gas industry was passing through a period of change which would probably prove to be the most important phase in its history, Sir Harold Smith said the industry was confronted by two new challenges. It had to face a growing shortage of carbonisation coals, accompanied by considerable increases in price and the advent of nuclear power in the generation of electricity. The new structure of the industry was an experiment in co-operation and this experiment had immense possibilities. 'It may lead, in fact it is confidently expected that it will lead, to the development of a new gas industry founded on new and improved techniques of gas production making use of raw materials other than coal in addition to types of coal not suitable for orthodox plants,' said the Chariman. Changes in gas-making technique would result in a balance between the most efficient of the conventional methods and the best of the new ones. The ultimate aim was to provide a cheaper gas supply.

Pointing out that the new gas industry would be the result of research and of advances in technical knowledge and skill, Sir Harold warned that if full advantage were to be taken of these it was vital that the best type of new entrants should be attracted and that the industry should be given every opportunity of being truly competitive in the field of fuel and power. The industry was operated mainly by men who had served it for many years and newcomers had acquired their enthusiasm and confidence in the future. 'There is still intense keenness to supply gas at the lowest possible price together with the best service,' said Sir Harold.

All of this has been said before, but it is gratifying to find it being said and quoted so frequently at the present time. The gas industry has received an excellent Press during the past few months, mainly because it is at last being recognised that it is of little use making important technical advances unless the public is told about them.

Personal

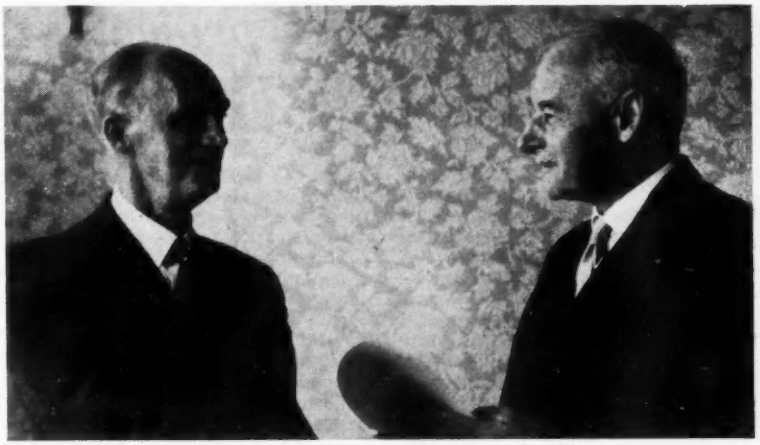
MR. J. E. STANIER, O.B.E., G.M., has retired as Divisional General Manager of the North Staffordshire Division of the West Midlands Gas Board. Mr. Stanier has spent the last 25 years with the gas industry in North Staffordshire and has played a leading part in the important advances made by the industry in that time. His early training was with the Birchenwood Coke Co., Ltd., where he served his articles as a chemical engineer. Later he moved to the north-east coast in the coke oven and by-product industry, and in 1919 joined Stockport Gas Department where he rose to be Deputy Engineer and Manager. In 1933 Mr. Stanier returned to Stoke-on-Trent as Deputy Chief Engineer and General Manager of the Corporation gas undertaking and was appointed its chief in 1943. On nationalisation he was appointed General Manager for the North Staffordshire Division, which comprises Stoke, Newcastle, Stafford, Leek, Congleton, Uttoxeter, Stone and Cheadle. When Mr. Stanier returned to Stoke in 1933 the undertaking's output was only 1,700 mill. cu.ft. a year. Now it is over 10,500 mill. cu.ft. Of this the pottery industry alone consumes 6,700 mill. cu.ft., which is more than the amount of gas used by a city the size of Leeds.

MR. LESLIE WILLIAM JOHNSON, Divisional Accountant, becomes Divisional General Manager of the North Staffordshire Division of the West Midlands Gas Board, in succession to MR. STANIER. MR. ERIC NEWTON FARNWORTH, Divisional Engineer, is appointed Deputy Divisional Manager. They take up their duties immediately.

Mr. L. W. Johnson

Mr. Johnson, who is 53, was appointed Divisional Accountant to the North Staffordshire Division of the West Midlands Gas Board in 1949. He is Chairman of the Board's Costing Committee and a Board representative on the Area Joint Council for Gas Staffs. Mr. Farnworth went to North Staffordshire in 1946 as Engineer and General Manager of the Newcastle-under-Lyme Corporation Gas Department, and in 1950 he was appointed to his present post of North Staffordshire Divisional Engineer of the West Midlands Gas Board.

MR. DAVID E. BURTON has been appointed to be in charge of the London Technical Sales Department at Ibex House, Minories, E.C.3, of Rocol, Ltd., Swillington, near Leeds, the specialist developers and manufacturers of molybdenised and other industrial lubricants.



Mr. J. E. Stanier (left) receives from the Chairman of the West Midlands Board, Mr. G. le B. Diamond, a copy of a resolution expressing appreciation of his services to the gas industry.

Diary of Forthcoming Events

November 14.—I.G.E. SESSION OF THE PUBLIC WORKS AND MUNICIPAL SERVICES CONGRESS: Olympia, London. 'Heat Services by Gas in the Modern Dwelling,' by F. J. Eaton and E. S. Harris, and 'Tar Roads for Modern Traffic,' by J. R. Dewhurst. 2.30 p.m.

November 18.—GAS OFFICERS' GUILD: Church House, Westminster, S.W.1. Annual General Meeting. 5 p.m.

November 18-19.—INSTITUTION OF GAS ENGINEERS: Church House, Westminster, S.W.1. Autumn Research Meeting.

November 19.—COMBUSTION ENGINEERING ASSOCIATION, WESTERN REGION: Park Hotel, Cardiff. Meeting, including paper on 'Smoke Abatement,' by J. Lawrence. 10.30 a.m.

November 19.—INCORPORATED PLANT ENGINEERS, DUNDEE BRANCH: Visit to Dundee Gasworks.

November 20. — YORKSHIRE JUNIORS: Whiteley's Café, Westgate, Huddersfield. President's Day.

November 20. — MIDLAND JUNIORS: Visit to works of the Rover Co., Ltd., Solihull.

November 21.—LONDON AND SOUTHERN JUNIORS: 'The Laboratory in Industrial Gas Practice,' by C. P. Henshilwood and R. Wharton (Watson House).

November 22. — YORKSHIRE JUNIORS: Sheffield. Paper on 'Desulphurisation by Oil Washing,' by R. Fleming and P. G. Harris. 2.30 p.m.

November 22.—SOUTH WALES SECTION, WALES AND MONMOUTHSHIRE JUNIORS: Cardiff. Paper by Mr. A. R. Bovington, Joint-holder of Woodall-Duckham Award, on 'Transmission and Utilisation' in the U.S.A.

November 24. — WEST MIDLANDS G.C.C.: Edmund Street, Birmingham, 3. Meeting at 2.30 p.m.

November 25.—LONDON AND SOUTHERN SECTION, I.G.E.: Pepys House, 14, Rochester Row, S.W.1. 'Some Problems Associated with the Production and Supply of Refinery Gas to the Gas Industry,' by I. F. S. Robinson, Technical Superintendent, Esso Petroleum, Fawley. 2.40 p.m.

November 25.—MIDLAND JUNIORS: Birmingham. Paper on 'The Genealogy of Remote Control,' by A. L. Hancock, Director of Walker, Crosweller & Co., Ltd. 6.30 p.m.

November 25.—SOCIETY FOR ANALYTICAL CHEMISTRY (PHYSICAL METHODS GROUP): Burlington House, London, W.1. Annual General Meeting followed by meeting on Modern Methods of Purification, including Paper on 'Preparative Scale Gas Chromatography,' by C. R. Patrick. 6.30 p.m.

November 26. — EASTERN SECTION, I.G.E.: London. Paper on 'Trends Toward Preventative Maintenance,' by W. Smith, Planning Engineer, and T. Pabst, Section Engineer, Vauxhall Motors, Ltd.

Obituary

MRS. I. M. JONES, who was the Vice-President of the Wolverhampton Branch of the Women's Gas Federation, has died. She was the wife of Mr. Stanley Jones, Divisional General Manager of the Wolverhampton District Division of the West Midlands Gas Board.

City and Guilds of London Institute is to change its address. From December 1 it will be 76, Portland Place, London, W.1. Tel: LANgham 3050.

First British Lurgi project will involve laying 133 miles of high-pressure pipeline

ABOUT 133 miles of pipeline will be required for the distribution of gas from the new Lurgi high pressure gasification plant now being built for the Scottish Gas Board at Westfield, Fife.

The Lurgi plant, the first of its kind in Britain, will cost about £6½ mill. and produce 30 mill. cu.ft. of gas per day, using low grade coal supplied by conveyor belt direct from the National Coal Board's biggest opencast site which is adjacent to the plant.

The project will be carried out in two main stages, the first of which will provide an output of 15 mill. cu.ft. of gas per day, and is expected to be completed by the autumn of 1960, and the second, providing an additional 15 mill. cu.ft. per day, is scheduled to be in operation two years later.

Maximum pressure

The pipeline, which will carry the gas from Westfield to the local grid systems around Glasgow in the west and to those of Perth and Dundee in the north, is designed for a maximum working pressure of 300 lb. p.s.i. Twelve-in. pipe will be used to carry the gas west to Coatbridge and north to Dundee, the toal length of pipe involved being 75 miles. A further 58 miles of steel branch lines ranging from 8 in. to 3 in. in diameter will supply individual undertakings and local grid systems.

The first section of the pipeline is being laid by Constructors John Brown Ltd. It runs for 13 miles from a point slightly to the west of the Westfield site in a south-westerly direction towards Dunfermline. In this section the pipeline mounts the rocky slopes of Benarty Hill (1,167 ft.) to avoid ground subject to mining subsidence, descends through farmlands, crosses streams, railways and roads and climbs to a height of 880 ft. above sea level in the forest of Blairadam where for most of the way it runs beneath the surface of a forest ride.

Special squads deal with road, rail and level crossings. Great care is taken to make good all land or obstacles disturbed in the process of pipe laying.

The pipe laying technique employed by Constructors John Brown is the one developed for long distance cross country oil pipelines and natural gas transmission lines and is based on American pipelining methods. The seamless, solid drawn steel pipes, in lengths of 25 to 45 ft., are taken from the storage dumps and strung along the prepared route. welded together above ground to form a continuous line, and 'snaked' into the trench by means of side-boom tractors.

The spread of squads engaged on the different operations of pipeline laying and testing normally extends over about a mile of country, and these have completed sections of 1¼ miles in one week, though under more favourable conditions this can be considerably exceeded.

When each section of the pipeline has been completed, it is submitted to an initial air test for soundness. Later it is tested for strength under a hydraulic pressure of 450 lb. p.s.i., and finally it is subjected to another air test over the entire length of the completed pipeline at 100 lb. p.s.i. for a prolonged period to ensure that no leakage can take place.

Austrian system

A ceremony marking the completion one month ahead of schedule, of a natural gas distribution system in Lower Austria which will save nearly half a million tons of coal a year and appreciably lower the cost of gas to the consumer, took place on the Semmering Pass recently.

The project, which involved the laying of about 130 miles of welded steel pipeline, was carried out on behalf of NIOGAS, the organisation responsible for gas distribution in Lower Austria, by Constructors John Brown, in association with Williams Brothers, of Tulsa, Oklahoma, and the Austrian contractor, engineer Hugo Durst. The contract, valued at £1½ mill., was completed in 11 months.

The lines, varying in diameter from 6 in. to 12 in., extend to two main areas, the first running from Schwecat, just outside Vienna, to the Semmering Pass, on the border of Lower Austria and Steiermark, with branch lines to Mannesdorf, Kottingbrun, St. Veit, Pernitz, and Schlogmuhl, and the second to the north-west of Vienna, from Tulln to Traismauer, with branches to St. Polten, Traisen and Krems.

Together with 90 km. of line which already existed, and about another 70 km. constructed this year under several smaller contracts, this high pressure gas distribution system, operating at 900 lb. p.s.i., supplies gas mainly to large industrial concerns in Lower Austria and also across the border, in the province of Steiermark. Some 20,000 domestic users are also catered for.

REFRIGERATOR SALES BOOM IN SECOND QUARTER

Comparative increase in gas consumption

SALES of gas in the quarter April-June, 1958, were 5% higher than in the corresponding quarter of 1957. This increase took place in all categories—domestic sales were 5% higher, industrial 4% higher and commercial and other sales 9% higher.

Sales of the chief gas appliances other than cookers were also higher during that quarter. The largest increase—188%—was in refrigerator sales; Sales of gas space heaters increased by 35% and of water heaters by 13%. Sales of gas cookers, on the other hand, fell by 4%.

Gas production was nearly 1% higher than the level of April to June, 1957. Coal gas manufacture was reduced by 5%, but water gas made was 35% higher. Oil gas production increased from just over 1.8 mill. therms in the first quarter of 1957-58 to 7.1 mill. therms in April to June, 1958.

Of the materials used for gas making, the quantity of coal carbonised decreased by 5%, but the quantity of coke used for making water gas increased by almost 29%. Gas purchased from coke ovens and oil refineries during the period April to June, 1958, was more than 3% greater than in the corresponding quarter of 1957. Total gas available was greater by 1%.

Coke production was 7% below the production in the April to June quarter of 1957. Sales of coke rose by 11%, but stocks were still 4% higher than a year ago. Crude tar production fell by 2%, and the output of crude benzole was 3% lower than in the previous year.

New gas-making plant of 30 mill. cu.ft. daily capacity was brought into use during the first quarter of 1958-59. This compares with 12.9 mill. cu.ft. in the first quarter of 1957-58.

An increase of 453 miles was made to the length of mains laid, 17% less than the increase in the same quarter of 1957-58.

The total number of employees in the gas industry at the end of August, 1958, was 1.5% below the figure for the end of August, 1957.

Change of title

Chemical Construction (Great Britain) Ltd., has slightly changed its title. In future the company will be known as Chemical Construction (G.B.) Ltd.

Long service awards

More than 20 employees of the Southern Gas Board in the Oxford and Reading regions received long service awards at a recent ceremony in Reading. The presentations were made by Mr. A. F. Hetherington, Deputy-Chairman of the Board.

Australian and N.Z. statistics show progress

THERE are now 1,298,000 gas consumers in Australia, according to the statistical year book of the Australian gas industry for 1957. Gas sales for 1957 totalled 203,729,000 therms, which represents a slight increase over the 1956 figure, commercial and industrial sales both having risen during the year. Domestic gas sales are about the same, having been affected by the unusually warm winter.

Appliance sales

The record figure in 1956 for appliance sales of £6,121,000 including installation charges and replacement parts was exceeded in 1957 by 5%, domestic appliances sales totalling £5,731,000, commercial and industrial appliances £694,000. Revenue from gas has also continued its upward trend and is now £30,261,000, an increase of nearly 6% on last year's figure of £28,703,000.

Production maintained

The New Zealand gas industry, in its statistical year for 1957, shows that it continued to maintain its previous level of production. Sales of gas rose by 2.6% to 19,375,000 therms. Revenue from gas rose to £2,768,000 for the year, an increase of 7.6%. There was a very sharp increase in revenue from by-products from £829,000 in 1956 to £968,000 in 1957, an increase of 16.8%.

New Zealand appliance sales have shown an increase of 56.7% over the previous year, but, as from 1957, installation costs are included in this figure.

The statistics for 1957 were furnished by 17 gas utilities in New Zealand representing 87% of the total gas issued in the Dominion.

COLESHILL—ROUND THREE COMING UP

A THIRD public enquiry into the West Midlands Gas Board's plans to erect a Lurgi gasification plant at Coleshill has been fixed for December 2.

The Board is still waiting to hear the result of the second public enquiry held at Coleshill a year ago.

It is now seven years since the Gas Board first began looking for a site in the Midlands, on which to build this plant.

The last public enquiry dealt with the Board's plan to build the Lurgi plant in Gorsey Lane, Coleshill. Warwickshire County Council refused planning permission and the Board appealed to the Minister of Housing. No decision has been announced yet.

In the meantime, the Board has suggested an alternative site—on an ash tip on the opposite side of the railway from the Gorsey Lane site. This is very near to a power station.

This site has been rejected by the County Council on the grounds that the plant should not be in the locality at all.

The Board has again appealed. So the Ministry Inspectors will be paying a third visit to Coleshill.

Simon-Carves Ltd.

Simon-Carves, Ltd., have declared an interim dividend of 10% less tax for the year ending December 31, 1958.

The increase of 2½% over the interim dividend paid in 1957 is intended to reduce the disparity between the interim and final dividends, and is no indication that the total dividend for 1958 will be greater than the figure of 25% paid for 1957.

The directors anticipate that the trading results for 1958 will be approximately the same as in the previous year.

COKE OVEN MANAGERS' ANNUAL DINNER

We must fight to retain our market, says President

WITH 'almost unparalleled' stocks of coke accumulating all over the country, every member of the staff of every coking plant must do his utmost to see that all possible orders for coke are obtained, 'or, more important, retained, to prevent changes to competing fuels.'

Mr. F. K. Illingworth, President of the Coke Oven Managers' Association, said this at the annual dinner on November 6.

On competition from other fuels, Mr. Illingworth said that he thought the price of fuels should be related to what one could call their 'convenience factor.' This was roughly the case with electricity, gas, coke and coal, but oil fuels were completely out of step.

To a great extent this was due to the taxing of these fuels. Petrol and diesel oil carried a duty of 2s. 6d. a gal. while heavy fuel oil was duty free. This put it into an unfair competitive position.

He suggested a drastic reduction in duty on diesel oil, petrol remaining unaffected, compensation for loss in revenue being effected by a duty levied on paraffin and heavy oils.

Reduced duty on diesel oil would help to lower the cost of living, help to stabilise wages in industries such as mining, lower distribution costs, and result in a more balanced demand for fuels according to their ease of usage.

The Clean Air Act must inevitably increase the use of smokeless fuels and this should benefit the coking industry.

Mr. Illingworth, referring to the opening of the Coking Research Centre at Chesterfield in a fortnight's time, recalled that exactly 250 years ago Abraham Derby had founded the modern coking and iron industries by being the first to use coke for iron smelting in his furnace at Coalbrookdale.

Mr. Illingworth was replying to the toast of the Association proposed by Mr. J. Latham, Deputy Chairman of the N.C.B., who had drawn attention to the satisfactory way certain major problems in the coking industry were being solved.

He referred to the shrinkage in coke demand and to the difficulties encountered in the reorganisation of the industry by the substitution of a limited number of large plants for many smaller ones. He spoke of the effective use of consultation with all concerned which had made this reorganisation possible with the minimum of hardship.

Clean air

Referring to the Clean Air Act, Mr. Latham pointed out that the market for domestic and industrial coke still remained disappointing and so far the Act seemed to be favouring alternative fuels. Both the coking and gas industries would have to work hard to develop improved cokes. They must also ensure that existing cokes were of high and consistent quality. Such products must be sold with energy and drive, backed by good service.

The toast to the guests was proposed by Mr. H. J. Victory, Senior Vice-President of the Association, and replied to jointly by Mr. Richard Fort, Chairman of the Parliamentary and Scientific Committee and Colonel G. G. H. Bolton, Chairman of the North Western Division of the National Coal Board.

The President presented to Dr. D. A. Hall, Durham Division of the N.C.B., the Association's silver gilt medal, together with a cheque for 50 guineas, 25 guineas each being given by Mr. Leslie O'Connor, Chairman of the British Coke Research Association, and the National Coal Board. It was given for Dr. Hall's paper on 'The Use of Ozone in the Treatment of Coke Oven Effluent.'

The President announced that Mr. G. W. J. Bradley had offered a prize of 25 guineas to be awarded in 1959 with the medal for the best paper given during the year by a member of the Association.

SCOTTISH BOARD LOSE SUPPLY

THREE million cu.ft. of coke oven gas a day has been lost to the Scottish Gas Board by the closing down, after being in operation for more than 100 years' of Dixon's Ironworks Ltd., Glasgow. The closure is due to the 'present state of trade.' The gas was being delivered to the Tradeston gasworks.

Minister opens clean air exhibition

THE first national exhibition on clean air since the Clean Air Act came into operation was opened in London yesterday by the Minister of Power, Lord Mills. This exhibition has been organsed by the Royal Society for the Promotion of Health at their offices in Buckingham Palace Road, London, S.W.1, and is to be open until November 14.

In his opening speech, Lord Mills said that the United Kingdom was the first country in the world to introduce by legislation a comprehensive system for dealing with a serious clean air problem, and he felt that the progress so far made was encouraging. He stated that already 29 smoke control areas had been brought into operation, and there were a further 152 proposals which had been submitted to the Government for consideration. He went on to say that action was most needed in the so-called 'black areas' and unfortunately the majority of local authorities in these areas had not yet come forward with clean air proposals. He urged them most strongly to act now.

His main concern, as the Minister responsible for fuel and power, was to see that the smokeless fuels necessary to make the Act effective were available when required. 'It is worth noting,' Lord Mills continued, 'that the use of smokeless fuels is already a well-established trend. There has, in recent years, been a marked tendency for coal to be used more and more in its smokeless forms—as electricity, gas and coke, as well as prepared smokeless fuels. Since 1948, coke consumption has increased by 15%, that of gas by 27%, while the consumption of electricity has doubled. Whereas before the war, these smokeless fuels accounted for only a quarter of the total fuel consumption in this country, they now account for 40% or more. This use of fuel and power in its refined forms will continue to grow and will be accelerated, of course, as the drive for cleaner air progresses.'

Councillor David Cobbold, Mayor of the City of Westminster, and Lord Mills, Minister of Power, inspect the Gas Council Stand at the exhibition.

Turning to the question of pressure on fuel resources, Lord Mills said that although in the last two or three years this pressure had eased, he wanted to make it quite clear that there was still a need for fuel efficiency. 'It is also essential,' he said, 'to see that the right sort of appliance is available to enable smokeless fuels to be used properly in the smoke control areas, and a large range of appliances is now produced which complies with the relevant provisions of the Clean Air Act.

One of the most attractive stands in the exhibition is that of the Gas Council. This shows how the gas industry is actively co-operating with local authorities in the drive to end domestic smoke by providing a complete smoke-free fuel service covering every space-heating and water-heating need.

New chemical company formed

BLAW KNOX LTD. have formed a new affiliated Company—Blaw Knox Chemical Engineering Co., Ltd.—with offices at 90/94, Brompton Road, London, S.W.3. Owned jointly by Blaw Knox Ltd., of London, and their associates, Blaw-Knox Company of Pittsburgh, Pa., U.S.A., the new company will design, engineer, procure and erect process plants as well as process equipment for the chemical and petroleum industries and serve and develop the British and overseas markets.

In addition to its own technical resources, the new affiliate will be able to draw upon the experience of the Chemical Plants and Buflovak Equipment Divisions of Blaw-Knox, Pittsburgh, whose Chemical Plants Division has an extensive background in the design of plant for general industrial chemicals, resins and plastics, caustic and chlorine, petrochemicals, food processing, pharmaceuticals, fine chemicals, fats and oils, among others. The Buflovak Equipment Division's products include evaporators, drying equipment, flakers, autoclaves and pressure vessels, and special designs of process equipment. The Blaw-Knox, Pittsburgh, research and testing laboratories will be available to Blaw Knox Chemical Engineering Co., Ltd., for customers' product research.

The Managing Director of the new company will be Mr. John Woade. Prior to joining Blaw-Knox, Pittsburgh, in 1956, Mr. Woade held numerous responsible positions in administration, design, construction and operation of diversified chemical plants and has supervised many foreign engineering and construction contracts. He graduated from the University of Colorado in 1940 with a B.Sc. degree in chemical engineering, following which he took post-graduate courses in business administration at the University of Pittsburgh and Columbia University. Other Directors will be Mr. C. H. Grist (Chairman), Mr. W. Cordes Snyder, Jnr. (U.S.A.), and the Hon. Alexander Hood.

County councils demand better coke

HOUSEHOLDERS, bakers and others who do not always find the coke supplies satisfactory are getting the support of individual county authorities in their demands for better quality.

One of these is Dorset County Council. It is urging the County Councils Association to make representations to the Government Departments concerned on the need for a standard of quality for coke. The Council is concerned not only with the fraudulent damping of coke but also with the protection of purchasers from misrepresentation by reason of the presence in coke of moisture which had not been introduced with any fraudulent intention; it points out, too, the need for control of the breeze and ash content of coke.

Huntingdonshire County Council is asking the Association to take steps for the establishment of either quality standards or declared specifications for solid fuel. Cambridgeshire County Council has asked that there should be included in any new legislation some means of protecting purchasers of coke from fraud attributable to water content; and Essex County Council is also seeking more protection for consumers.

In Lincolnshire the County Council has written to the Association, expressing concern that no legislation has resulted from the report of the Hodgson Committee. The County Council were concerned, in particular, at the lack of adequate general statutory measures to provide safeguards to the public in connection with the sale of coke, and they pointed out that a number of weights and measures authorities had obtained local powers from Parliament. This had resulted in an unevenness over the country which was most undesirable and confusing to traders. The County Council were not disposed to add to the number of local Acts on the subject and felt very strongly that the Government should now take action. It had been noted that the Parliamentary Secretary to the Board of Trade recently announced the impending issue of regulations under existing legislation as an interim measure until Parliament could consider new legislation. The County Council trusted that the new regulations could and would be made to cover, *inter alia*, the sale of coke and put the safeguards with regard to that form of fuel on the same footing as those for the sale of coal.

From a paper to the joint meeting of the I.G.E., the Coke Oven Managers Association and the British Coke Research Association, London, November 5.

Development and Co-ordination of Gas Grid Supplies from an Integrated Steel Works

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THE relationship between coke oven gas suppliers and gas undertakings in the early days was personal by reason of its individuality. One coke oven plant supplied one undertaking, and no operational or economic reference was made—or could be expected to be made at the time—to regional or national interests. Each party went about its own main business—one acknowledging a new channel of output; the other regarding and accepting coke oven gas if not with longing, at least with discretion. Later, there came mutual realisation of the value—one party to the other—and also a challenging acceptance of the responsibility placed upon both industries to make substantial contributions to the national fuel economy.

These steps from the past to the present lead firmly to the possibility and to the necessity of development and co-ordination between coke oven supplies and the gas industry.

In 1921, the first contract, between Baldwins, Ltd., and the Corporation of Port Talbot was signed for the supply of coke oven gas to the Margam gasworks, the contract amounts being 5 mill. cu.ft. per month. The contract was renewed in 1927, and again in 1929. However, during the economic depression in 1931 the steel industry found difficulty in maintaining the contract quantities and, therefore, the Corporation decided to erect a new vertical retort installation on the present Aberavon gasworks site. In 1933, the coke oven suppliers offered to resume supplies under the 1929 agreement, but as the new vertical retort installation had been completed at Aberavon, the Corporation decided to rely on manufactured gas. The system of manufactured gas prevailed until 1940, when, following negotiations between Guest Keen and Baldwins, Ltd., and the Corporation a supply of 70,000 cu. ft. per hour of coke oven gas was agreed by both sides and received into Aberavon gasworks at this time. The figure of 70,000 cu.ft. was increased, by agreement, to 100,000 cu.ft. maximum during the second world war.

In 1946, the Steel Company of Wales submitted to the Corporation a long-term forecast of availability of supply showing 280,000 cu.ft. per hour available in 1948; 730,000 cu.ft. per hour when the new installation of coke ovens would be completed. The Steel Company of Wales then said that these large-scale quantities of coke oven gas could be made available provided the right terms and conditions could be agreed. This offer came at a very appropriate time indeed, inasmuch as the increasing demands for gas had exceeded the productive capacity of many gas undertakings in the area, and it was vitally necessary that there should be a marriage of surplus and deficiency. The supply and demand positions in the area had caused concern to the then British Gas Council, and the South Wales District Committee of that Council had submitted memoranda to the Council setting out the problem. The area had been scheduled as a development area with the resultant introduction of numerous new factories, most of which required large quantities of gas, and this combination of circumstances created serious problems of an urgent character.

The Corporation informed the Ministry of Fuel and Power of the Steel Company of Wales' forecast and offer, and this probability of additional supplies of gas balanced against the pressing problems of gas undertakings was the reason and the essence of a meeting convened in 1946 by the Ministry of Fuel and Power to explore the possibilities of gas undertakings utilising the increased availability of coke oven gas. Planning and development have resulted in large-scale coke oven supplies being available, and in the building of a gas grid supply station.

A working party, set up in 1946, with Mr. E. M. Edwards as convenor, recommended that:—

(i) Coke oven gas from existing and future coke oven

gas plants be made readily available to gas undertakings by means of a gas grid, and that a gas authority be set up to be responsible for such gas grid.

(ii) Provided satisfactory terms for the supply of coke oven gas from the Margam coke ovens be obtained from the Steel Company of Wales, the gas grid authority develop immediately the gas grid scheme contained within the Report.

(iii) The future development of the scheme—providing for bulk supplies of gas to the gas undertakings serving areas in Carmarthenshire—be considered by the gas grid authority at a later date.

(iv) The development of gas supplies to gas undertakings in the extreme West Wales area be the subject of a separate investigation.

The Report was presented at a second meeting convened by the Ministry of Fuel and Power on November 29, 1948, when unanimous support of the recommendations was forthcoming, but agreement by the gas undertakings represented could not be reached on the terms of supply. The Ministry of Fuel and Power had authorised certain gas undertakings (*e.g.*, Port Talbot and Bridgend) to lay interconnecting mains to meet special cases, such as Bridgend Trading Estate, industrial development at Maesteg, and replacement of plant at Porthcawl. Work commenced on these projects immediately following the authorisation.

Discussions continued between gas undertakings and the Ministry on the technical and commercial desirability of entering into an agreement with the Steel Company of Wales for the supply of 730,000 cu.ft. per hour, but no new agreement was forthcoming. However, the Port Talbot Corporation, fundamentally to safeguard its own future gas supply position, and to provide for limited bulk supplies to neighbouring gas undertakings, decided to complete negotiations with the Steel Company of Wales for a contract of 280,000 cu.ft. per hour.

Two Problems

On May 1, 1949, the gas industry was nationalised. It was very evident that the 280,000 cu.ft. of the coke oven contract, together with the capacities of the existing gas production plants of undertakings in the district, were insufficient to meet even slight increases in the then known present demands, and so in August, 1950, the Wales Gas Board decided to meet the position by concentrating development of additional supplies at Aberavon gasworks. At that time, Aberavon gasworks was receiving approximately 170,000 cu.ft. per hour of gas from the coke ovens, of which an amount of 50,000 cu.ft. per hour was being sold industrially in its unpurified state. Purification plant available at Aberavon had a maximum capacity of 2.5 mill. cu.ft. per day, and compression plant of 80,000 cu.ft. per hour. Therefore, two problems presented themselves: (i) Installation of temporary plant to meet immediate demands, and (ii) permanent developmenut necessary to utilise the 280,000 cu.ft. per hour of the coke oven contract, and the additional gas-making plant to meet the needs of the future.

(i) *Temporary Plant.* The purification capacity was increased to 5.5 mill. cu.ft. per day by transferring two sets of disused purifiers to Aberavon gasworks. The capacity of the compressing plant was increased to 220,000 cu.ft. per hour by the installation of second-hand compressors from other undertakings of the Board. The cost of the work was approximately £50,000, which was regarded as a well-paid premium to ensure the continuity and development of supplies. As a result of this temporary work, the Aberavon gasworks was then able to supply gas to Port Talbot, Porthcawl, Bridgend, Maesteg, and a partial supply to Neath. The holder capacity at Aberavon was only 360,000 cu.ft., and the peak hourly output was approximately 350,000 cu.ft. It would, therefore, have been impossible to maintain supplies to the grid now coming into being, without the full co-operation of the Steel Company of Wales, inasmuch as its plant had to take up any variation in demands.

(ii) *Permanent Development.* It was decided that, in addition to anticipating the full use of the 280,000 cu.ft. per hour of coke oven gas, to have available an additional 250,000 cu.ft. per hour of manufactured gas during winter periods, and to erect two 125,000 cu.ft. per hour water gas plants together with the necessary purification and compression plants.

Additional Plant

While this work was proceeding, the Board commenced discussions with the Steel Company of Wales for additional quantities of coke oven gas, and agreement was reached in 1952 for the quantity of 280,000 cu.ft. per hour, to be increased to 800,000 cu.ft. per hour by January, 1956. The latter figure included a quantity of gas to be transmitted from the Steel Company of Wales' works at Port Talbot, to the new cold-reduction plants then being built at Trostre and Velindre for the Steel Company of Wales. Arrangements were also made at this time for the supply to Aberavon gasworks of 50,000 cu.ft. per hour of blast-furnace gas to be used as a diluent for the control of calorific value. During the first phase of the development, thought had been given by the Co-ordinating Committee to the technical extensions necessary for dealing with the new contract quantities. The additional plant envisaged and recommended was:

Reinforced-concrete purifiers, capacity of 12 mill. cu.ft. per day.

Two high-tension electrically driven compressors, each of a capacity of 374,000 cu.ft. per hour against 25 p.s.i. (with after-coolers).

Additional coke oven and station meters, and works main.

Blast-furnace boosters and a 2 mill. cu.ft. capacity gasholder.

It was also necessary to revise the design of the compressor house, workshop, stores, and the administrative block. Fortunately, the decision to increase the quantity of coke oven gas was made before construction commenced on the original design in the development phase.

Early in 1956, it became apparent that demands for gas were exceeding supplies available under the coke oven contract, a situation that resulted in the peak-load plant coming into operation for longer periods than were economically desirable. Therefore, as an important part of the policy of the Wales Gas Board of making the most efficient use of available supplies of gas

Fig. 1. Areas of the Central and Western sections of the South Wales gas grid, and the undertakings being supplied from Aberavon gasworks.

from all sources, negotiations took place between the Wales Gas Board and the National Coal Board for supplies of methane (firedamp). These negotiations culminated in an agreement for the supply of firedamp from three nearby collieries. The firedamp was to contain approximately 65% of methane, the total contract figure being equivalent to 7 mill. cu.ft. per week of pure methane, and the first supplies were to be made available by October, 1957. At the same time, and running technically therewith, arrangements were made with the Steel Company of Wales for the existing contract supply of blast-furnace gas to be increased from 50,000 to 150,000 cu.ft. per hour. The layout of the works was then designed to handle 30 mill. cu.ft. per day, and be capable of further extensions to deal with 45 mill. cu.ft. per day. Additional plant ordered as a result of these further extensions was as follows:—

'Gastechnik' purifiers, capacity 6 mill. cu.ft. per day, a dual-fuel-fired compressor, capacity 374,000 cu.ft. against 25 p.s.i. (with after-coolers), and two blast-furnace gas boosters, each of 100,000 cu.ft. per hour. Calorific value control equipment was also ordered, to maintain a constant calorific value by varying the amount of blast-furnace gas being used as a diluent, thus taking up any variations in calorific value of the methane and coke oven supplies. The dual-fuel-fired machines were converted to use methane as an alternative to town gas, and a 100 ton butane plant was also included.

The purpose of the butane plant is three-fold: (i) To act as a thermal standby for temporary interruptions of the methane supply; (ii) to enrich the coke oven gas during temporary breakdowns affecting its calorific value; and (iii) to reduce the periods when the water gas plants have to be kept under fire. The first supplies of methane were taken in October, 1957, and since then the quantity available has been built up to the contract figures.

This project has proved entirely satisfactory and negotiations are now taking place for larger quantities of methane. Discussions have already taken place with the Steel Company of Wales to ascertain whether it will be posible for methane to be used as a sulphur-free fuel at the steel works, thus allowing more coke oven gas to be supplied to Aberavon gasworks. These negotiations are still proceeding. Thought has also been given by the Board to the installation of plant for the reforming of methane during the summer periods.

The several phases of development at Aberavon gas works were all part of the creation by the Board of the South Wales gas grid, and as construction at Aberavon works proceeded so did the large-scale mainlaying

required to form the grid. Fig. 1 shows the areas of the Central and Western sections (formerly called Western section only) of the South Wales gas grid, and the undertakings supplied, and to be supplied from Aberavon gasworks. As the number of undertakings connected to Aberavon gasworks via the grid increased, it became necessary to introduce a system of grid control at Aberavon works. One of the outstanding benefits of grid control is the planned utilisation of gasholder storage of connected undertakings, and in this way the heavy capital expenditure required for new holder storage is materially reduced. This winter (1958-59) the Central and Western sections of the South Wales gas grid will operate, in the confidence of past experience, with a total gasholder storage of 39% of the estimated maximum day's demand.

Co-operation Necessary

Since any repair work carried out on grid mains, or at Aberavon gasworks, can result in a marked reduction in the flow of gas that can be taken from the coke ovens, close consultation with the Steel Company of Wales is vitally necessary to ensure an agreed programme of supplies throughout the period of repairs. Similarly, if there has to be a temporary reduction of the coke oven supplies by reason of repair work, or an emergency, within the Steel Company of Wales plant, close co-operation is still vitally necessary as gasholder storage facilities of the whole grid, together with the standby water gas plants of the Swansea and Neath gas undertakings, are available to assist in the programme of repairs and the alleviation of emergencies.

The paper goes on to describe developments at the Margam coke oven plant of the Steel Company of Wales, which have taken place from 1951 onwards. At the end of 1951, the coke oven plant consisted of three batteries of Simon Carves compound ovens, one underjet with triple regenerators and two of the superjet type. In all there were 144 ovens with a throughput of 20,150 tons of coal per week and a total gas making capacity of 210 mill. cu.ft. per week. All coke oven gas for external distribution, except that used on boilers, passed through a final multi-stage ring-packed gas-oil washer (for naphthalene removal) and thence through boosters either for supply to the Wales Gas Board at 6 p.s.i. pressure or to the steel works medium-pressure system at approximately 25 in. w.g. pressure. During 1951 to 1953, it was necessary to plan an extension of the coking plant to meet the needs of a general extension of the iron- and steel-making capacity of the Company. It was decided to build a new battery of 90 coke ovens with the necessary semi-direct by-product plant and coke-screening plant, in order to raise the total blast furnace coke make to 22,350 tons per week. Following decisions upon the capacity and siting of the extended carbonising plant, it was necessary to consider in detail the disposal and handling of the increased make of coke oven gas and the best practical method of effecting the gas link-up between old and new plant. The anticipated make of gas was of the order of 2.1 mill. cu.ft. per hour, and there was a possibility of future increase to 2.3 mill. cu.ft. per hour. After due consideration of the works fuel balances, it seemed that 750,000 cu.ft. per hour would be available to the Wales Gas Board, including supplies required at the Trostre and Velindre works of the Steel Company of Wales, while a side stream feed of 200,000 cu.ft. per hour would be required from this system within the works boundaries. A quantity of 1 to 1.4 mill. cu.ft. per hour would be required for works uses. Delivery pressures ex coke ovens were determined by the linkage to existing systems at 6 p.s.i. for the former and approximately 25 in. w.g. for the latter disposal.

The following conditions had to be covered in planning and executing the scheme for extending the coke oven gas network:—

(i) Continuity of operation of existing coke ovens had to be maintained, and interruption of gas supplies to the Wales Gas Board and the steelworks had to be minimised.

(ii) In view of the plants' proximity to a residential area, every possible step had to be taken to avoid plant shut downs that would result in escape of raw gas to atmosphere.

(iii) The final gas-handling system had to be such as to ensure to the highest possible degree continuity of gas supply to the Wales Gas Board. Although this amounted to only 20 to 30% of the gas likely to be handled, the Steel Company of Wales was very conscious of its obligations to a public undertaking in ensuring this continuity, and arrangements to this end were given first-line priority in planning plant and change-over operation.

(iv) The final system should ensure the highest possible degree of continuity of gas handling when dealing with either foreseeable future maintenance or likely plant alterations or extensions.

(v) Extension and interconnections of the gas-handling system had obviously to be carried out before the new batteries could be brought into operation.

100% Standby Plant

Existing booster capacity was inadequate for the new demands on either medium- or high-pressure systems. After due consideration of requirements and possible method of installation and ultimate control, it was decided to locate the future medium-pressure boosters in the existing house and locate the future high-pressure boosters in the new plant exhauster and booster house. The combination of boosters and their ranges chosen were decided mainly by the needs for providing 100% standby plant for the high-pressure gas system in the event of power failure and maintaining maximum flexibility in the system. The extension network mains were planned on the basis that, under the worst foreseeable conditions on any section, the average velocity of gas in the main should not appreciably exceed 50 ft. per second and should in no case exceed 60 ft. per second, with the exception that the maximum velocity on a bleeder pipe might be allowed to reach 90 ft. per second. As far as possible, attention was given to provision of ring mains to provide alternative gas routes when isolating sections of plant for maintenance or renewal without affecting the rest of the plant, and for use of plant items as mutual standbys (*e.g.*, high-pressure gas can be bled into the medium-pressure main if medium-pressure boosters must close down, and *vice versa*).

If for any reason it were necessary to stop boosting of both high-pressure and medium-pressure gas supplies, but possible to fire all the ovens on coke oven gas, it

would be necessary to flare about 1 mill. to 1.1 mill. cu.ft. of gas per hour; it might, however, be necessary, if all ovens were fired with blast furnace gas and the gasholder were full, to flare 1.5 to 2.3 mill. cu.ft. of gas for short periods, while change-over occurred. The existing 22 in. flare was inadequate for this duty, and, after debate as to the safety merit of a one- or two-flare system, it was decided to retain the old flare as an auxiliary and build a new flare pipe with equivalent diameter of 30 in. The gasholder existing in 1951 was a water-sealed, column-guided two-lift holder of 750,000 cu.ft. capacity. Successive development had reduced the relative capacity of this holder from 2¼ hour total gas make to 1½ hour total gas make and then to approximately 40 minutes gas make. It was therefore decided to install a new gasholder of 3 mill. cu.ft. capacity. A Klonne type dry gasholder was chosen by virtue of the fact that it could absorb surges at the rate of 3 mill. cu.ft. per hour, offered a relatively uniform governed pressure throughout the system (where a multi-lift holder might at the lowest level effect coke oven gas firing of the ovens adversely) and was relatively cheaper; these advantages were considered to outweigh the inherent safety of the water-sealed type of holder for this particular application. It was only just possible to complete erection and commissioning of the new gasholder before battery 4 started operation.

Power of Veto

The allocation of coke oven gas to all consumer units, including the coke ovens, is decided by the works gas control, and coke oven operators act to the controller's instructions regarding the disposal of gas. As an overriding safety measure, however, the senior official on duty on the coke oven plant exercises an absolute power of veto on the total amount of coke oven gas sent out from the plant; if the plant might be in any way endangered or adversely affected, it is his duty to limit the total sent out in accordance with the needs of the situation.

The final form of the coke oven plant in service at the Abbey works, Margam, in August, 1958, consisted of five batteries of Simon Carves compound ovens, two of the superjet type, one underjet with twin regenerators, and two underjet with triple regenerators. The throughput of coal had increased to 32,000 tons per week and the total gas make to 336 mill. cu.ft. per week. New additional plant consisting of a battery of 80 coke ovens complete with by-product plant and boosting equipment is now construction. The anticipated new coke oven gas make of 700,000 to 750,000 cu.ft. per hour will be boosted into the steelworks medium-pressure system of mains. The increase in flexibility of the works fuel system as a result of incidence of the new supply of coke oven gas should further safeguard the present supply to the Wales Gas Board. While under normal working conditions, the make of coke oven gas is virtually constant, normal conditions are interrupted from time to time. The make of blast furnace is, however, subject to wide fluctuations even under normal conditions, since blast furnaces are taken 'off,' and put 'on,' at very short notice. To ensure that, under any conditions likely to be met, the least possible interruption to any fuel consumer be permitted, and therefore that maximum use be made of the flexibility of the system by the interchangeability of fuels, a central gas distribution control station has been set up. The control room is continuously manned 168 hours per week by men trained on the plant, such training having included a long period with experienced blast furnace gas-cleaning plant operatives, as well as frequent visits to all gas-consuming and gas-producing units. The gas distribution controllers are kept fully informed of coke oven and blast furnace gas production conditions, and are daily briefed regarding gas allocation priorities and the availability of auxiliary fuels.

The coke oven gas supplied to the grid station at Aberavon forms an essential part of a developed integrated fuel plan operating for the whole of the Steel Company of Wales' works. Considerable flexibility in the use of alternative fuels exists, and an appreciable reservoir of supply is ensured by means of holder and fuel storage. The interchangeability of fuels not only secures an adequate uninterrupted supply of heat to all works processes, but also ensures the flow of coke oven gas supplies to Aberavon gasworks, without provision of very large holder storage. The coke oven gas supplied to Aberavon gasworks ranks in significance and importance with the internal fuel requirements of the Steel Company of Wales. The flexibility and efficient use of the varied fuels at the Steel Company of Wales works, and the resultant large-scale flow of coke oven gas to the gas grid supply station at Aberavon, and thence to the grid itself, with its many thousands of industrial, commercial, and domestic consumers, is, it is felt, of particular benefit to local civic and commercial prosperity, and is a contribution (and possibly an indication) of significance to the national fuel economy.

Steels for Use in Chemical and Petroleum Industries

BRITISH Standards for steels for use in the chemical, petroleum and allied industries (B.S. 1501-1506: 1958) and low temperature supplementary requirements (B.S. 1510: 1958) have just been revised and have been prepared as part of a comprehensive scheme of codes for pressure vessels for use in the chemical and allied industries. They supersede the previous (1950) editions. There are four separate specifications in the first-mentioned series: 1501, 1503, 1504, 1506, the numerical 'gaps' having been left for possible allocation to other forms of material as and when necessary.

This edition (84 quarto pages) deals with plates, bars and sections, forgings and castings, and bars for bolting material. In view of the comprehensive character of these standards and of the possibility that requirements for further steels will be added to it from time to time, a system of numbering has been adopted which indicates each type of steel irrespective of its form. An appendix explains the system and indicates the basis on which it has been built. A helpful feature of the publication is its indication of the nearest equivalent American steel in either the A.S.T.M. or the A.I.S.I. series.

In view of the need for special requirements for steels operating at low temperatures, the companion to this revision, B.S. 1510, has been issued. It relates to 18 steels for operation at low temperatures and to applications where a high degree of notch ductility is required.

From the Presidential Address to the Midland Junior Gas Association, Birmingham, October 7.

The Development of the Wolverhampton District Grid

By G. W. F. COCKAYNE, Assoc.M.Inst.Gas E.

DIVISIONAL DISTRIBUTION ENGINEER, WOLVERHAMPTON, WEST MIDLANDS GAS BOARD.

I PROPOSE giving an abbreviated account of some of the work done in the Wolverhampton and District Division of the West Midlands Gas Board since I took office as Divisional Distribution Engineer in 1950. My terms of reference on appointment were set out quite clearly as follows:

1. To survey, as a matter of urgency, pressure conditions in each of the ten towns which make up the Wolverhampton Division. To make recommendations to deal, if necessary on a short-term basis, with areas showing serious pressure deficiencies, particularly those where pressures fell to below the statutory minimum.
2. To follow up (1) with a critical examination of the distribution systems of each of the ten towns, and to lay down, where necessary, a master plan to provide a distribution system which would be adequate to meet the requirements of the following 20 years at least.
3. To prepare for submission to the Board a scheme for integrating the ten works in the Division.
4. To institute as soon as possible a code of good distribution practice to supersede the known poor standards existing throughout the Division.

A logical approach to a pressure survey was made extremely difficult by the almost complete absence of any adequate mains plans. In none of the ten undertakings was there a complete record, and in the majority the records existed only in a variety of odd district drawings in varying stages of preservation, and in the minds of district personnel. Time did not permit of a real attempt to prepare adequate mains records, this came later, but by judicious use of what existed and with the most excellent co-operation of the older district personnel, records, sufficient on a short-term basis for the work in hand, were produced.

Eighty Charts

The eight strategic points chosen for the installation of permanent seven-day pressure recorders were intended to show average pressure conditions in the areas in which they were situated. It was intended to supplement the records taken at these permanent reading points with spot checks using portable recorders on the fringes of each area. The 80-odd charts were changed weekly and sent to the Divisional Office where they were scrutinised. Really alarming pressure conditions were revealed in many areas, particularly over peak load periods. It soon became evident that, while in some cases alleviation of the conditions could be given fairly quickly and at little cost, considerable planning and heavy capital expenditure would be needed to rectify the position throughout the Division. This permanent pressure survey is still in full operation, and has become a most important and valuable part of our organisation.

The results given by this survey showed that major re-planning of the distribution systems would be needed in some towns. It was decided that the largest town in the Division, Wolverhampton, should be dealt with first. The first requirement was to prepare really adequate plans of the existing distribution system. This was a slow and laborious task but gradually, using existing plans and a wealth of what has proved to be reliable knowledge of the system by long service distribution personnel, a set of main plans to a scale of 1/2500 was produced. Wolverhampton is one of the more important industrial towns of the West Midlands with a population of 200,000 in the area supplied by the gas undertaking. The County Borough is very heavily built up and has little space within its boundaries for either domestic or industrial development. The Corporation has, therefore, concluded agreements with three neighbouring authorities to build houses in their areas to accommodate the overspill population of Wolverhampton. The gas undertaking supplies gas to these three local authorities' areas in addition to the County Borough of Wolverhampton. The growth of the undertaking can be gauged from the statistics shown in Table 1.

Table 1.

Year	1951	1957
Number of consumers	52,513	58,367
Miles of main	276	339
Annual sales—mill. cu. ft. ..	2,712	3,407

In addition to town gas, Mond gas supplied into the area amounted to 1,407 mill. cu.ft. in 1951.

In designing a reinforcement system for an existing distribution network certain basic information with regard to peak consumption is necessary. This is often available only in the form of the maximum day and maximum hour's output from the works. For this particular purpose, however, it is required for the various areas to which new sources of supply must be given. Since actual consumptions in this form are seldom, if ever, available, estimates have to be made and the first

move was to establish a basis for estimating, which will give sufficiently accurate results. The following was the basis on which the maximum hourly consumption in various sections of the town was estimated:—

(*a*) A comprehensive pressure survey of the whole area indicated the points at which reinforcement was necessary, and showed the advantage of dividing the town into six separate sections. Each section except the central section would have its new reinforcement point or points as the case might be.

(*b*) The consumption of gas in each section could reasonably be divided under the headings of industrial, commercial, domestic and public administration. The actual figures for these headings were known, but only for the town as a whole.

(*c*) For the January/March quarter of 1951 these were industrial 328 mill. cu.ft., commercial 73.5 mill. cu.ft., domestic 359.5 mill. cu.ft., public administration 12.4 mill. cu.ft. The maximum hour's output in 1950-51 which occurred on a weekday was 935,000 cu.ft. To estimate the average weekday consumption during this period under each heading, divide by the number of working days (see Table 2).

Table 2.

	Average weekday Consumption. Mill. cu. ft.
Industrial	328 *mill. cu. ft.* 63 working days = 5.2
Commercial	73.5 *mill. cu. ft* 78 working days = .94
Domestic	359.5 *mill. cu. ft.* 90 working days = 4.0
Public administration	12.4 *mill. cu. ft.* 70 working days = 0.18
	Total 10.32

Since the maximum hour's output fell on a Tuesday when gas would be consumed in all the above categories, the proportions of the maximum hour's consumption attributable to each of these respective loads can be calculated. This gave estimated maximum hour consumptions as follows:—

Industrial $\frac{935{,}000 \times 5.2}{10.32}$ = 472,000 cu.ft. approx.

Commercial $\frac{935{,}000 \times 0.94}{10.32}$ = 85,000 cu.ft. approx.

Domestic $\frac{935{,}000 \times 4.0}{10.32}$ = 362,000 cu.ft. approx.

Public Administration $\frac{935{,}000 \times 0.18}{10.32}$ = 16,000 cu.ft. approx.

(*d*) Since the industrial load is particularly heavy and made up of individual loads of great variation in magnitude, it was necessary to estimate the maximum hour's consumption of each individual consumer so that allowance could be made for these loads in the particular areas in which the factories were situated. The estimated industrial load during the maximum hour, 472,000 cu.ft., was then proportioned among individual works as follows:—

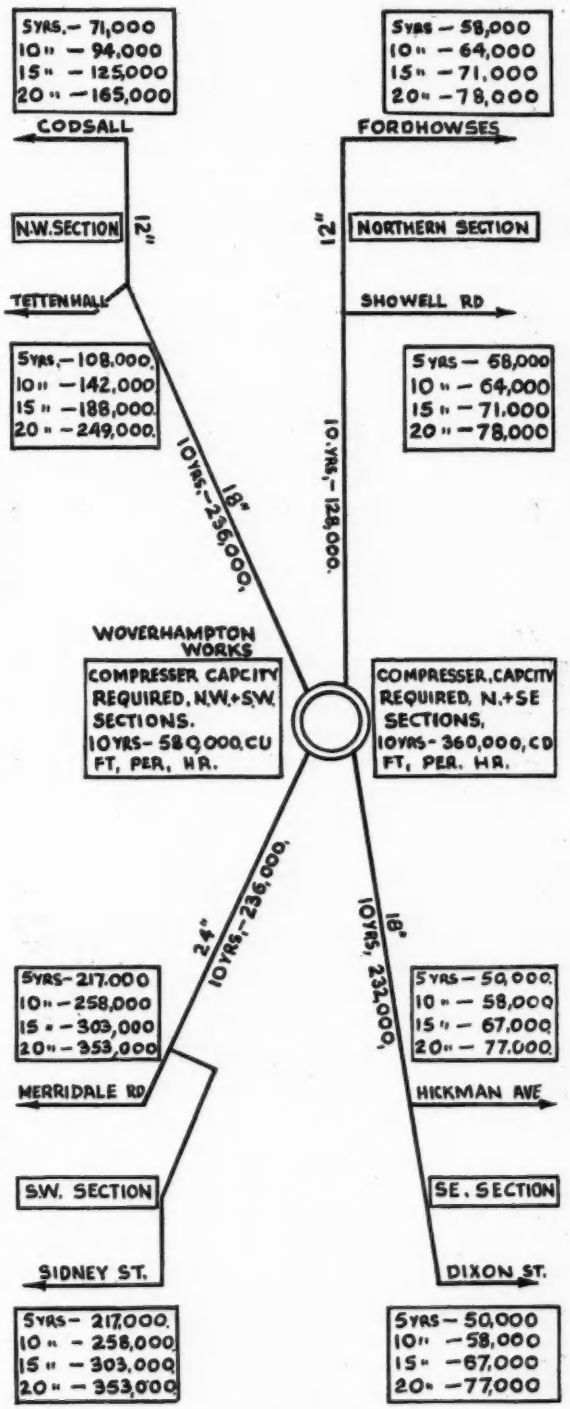


Fig. 1. Flow diagram for the reorganisation of the Wolverhampton district distribution system.

The annual consumptions for the year 1950-51 for each individual works having an annual consumption of 5 mill. cu.ft. or over were taken from

records and tabulated, and the estimated industrial load during the maximum hour was then proportioned among the individual works on the basis of their annual consumption.

(*e*) It was decided that allowance should be made in estimates for the ultimate closure of the Mond gas works which has a very substantial output to the Wolverhampton area. In this case maximum hour figures were available for each individual Mond gas consumer, and it was only necessary to adjust these figures to compensate for the higher calorific value of town gas.

(*f*) To estimate the existing domestic consumption for each of the six sections, the approximate number of existing houses in each section was taken and the estimated domestic maximum hour's consumption referred to above, *i.e.*, 363,000, was allocated to each section in the proportion of the number of existing houses.

(*g*) Since the commercial consumption during the January/March quarter of 1951 was 20% of the domestic load, this same proportion of the estimated domestic maximum hour in each section was allocated for commercial consumption.

After estimates of the existing maximum hour's consumption had been arrived at for each individual section, they were then increased by 2% compound per annum to cover normal development for the next 20 years. This method was applied to the south-eastern, south-western and northern sections which were considered to be subject to normal industrial and domestic development, and would be fully developed in 20 years. the north-western section on the other hand, which covered a large residential area with little or no industry, called for special treatment since the major part of the domestic development programme was to be concentrated here. Firm figures of this development over 20 years were supplied by the town planning authorities, so instead of increasing the estimate by the annual figure of 2% compound, the estimated existing consumption plus an estimate for the 11,000 new houses planned was taken as the future load. The stage had now been reached when the flow diagram shown in Fig. 1 could be drawn.

Adequate Supply

This makes no allowance for the eastern section which covered a large industrial area of Wolverhampton, and Wednesfield, since at the time the Board considered the building of a large new works at Willenhall, the site of which would be within 2½ miles of the centre of the Wednesfield area, so that any reinforcement for this area would come direct from the new works. The new works at Willenhall did not materealise but a 24-in. grid main has since been laid from the Walsall works into the No. 2 Division, a branch from which has been taken into the heart of the industrial area of Wednesfield with an extension into the area where 6,000 new houses are scheduled. Thus the eastern section has been reinforced at relatively small cost and is now very adequately supplied.

The northern, south-eastern and south-western sections are heavily built-up areas, and it was obvious that to lay new mains, either large diameter low pressure trunk mains or smaller high pressure feeder mains, through these areas would be a very difficult and an extremely costly business. The possibility of utilising any of the existing larger diameter low pressure trunk mains at medium or high pressures was carefully investigated with very encouraging results. A 24-in. and an 18-in. trunk main already laid through the most heavily built-up areas were found to be capable of extension to satisfy the requirements of the south-west and south-eastern sections respectively if worked under a maximum pressure of 5 p.s.i., while an existing 12-in. main similarly extended and also working at a maximum pressure of 5 p.s.i., would satisfy the requirements of the northern section. The 18-in. and 12-in. mains had been laid with mechanical joints and tested to 20 p.s.i., but the 24-in. main had some lead joints. It was decided to utilise this main but that it should be the subject of careful leakage surveys after being brought into use under pressure, and if necessary leak clamps should be fitted to each joint. Unfortunately it was not possible to utilise any of the existing mains to supply the north-western section. However successful negotiations with the proprietors of the Wolverhampton racecourse for the laying of 1,500 yards of 18-in. main across the course meant that the majority of the thickly built-up area on this side of the town could be bypassed. It was, therefore, decided to lay new 18-in. and 12-in. medium pressure feeder mains direct from the works to supply the north-western section.

Room for Expansion

The scheme involved eight new district governor stations, one at each of the new distributing points and a compressor plant. The medium pressure feeder mains supplying the north-western and south-western sections leave the works on the west side, and those supplying the north and south-eastern sections on the east side. Since these points were on the opposite sides of the works, the compressing plant would have to be in two separate units. It was decided to provide plant to cover the first ten years' requirements and to leave room to add to the plant as necessary. A further decision was that the individual machines should be identical in all respects so as to make maintenance and replacement of parts as simple as possible. The method of driving the machines would also be identical and would be by electric motors through fluid couplings, an auto-starting diesel standby generating set being available in the event of power failure. The capacity of the plant required was: For the north-east and south-west sections 580,000 cu.ft. per hour at 5 p.s.i. would be provided by two units each of 300,000 cu.ft. per hour, and a standby set of equal capacity. For the north and south-eastern sections 360,000 cu.ft. per hour at 5 p.s.i. would be provided by one unit of 300,000 cu.ft. per hour, and a standby set of equal capacity. Competitive tenders were received from each of the leading compressor manufacturers and it was ultimately decided to adopt the C.M.44—2 stage high speed Rateau turbo booster by Bryan Donkin Ltd., running at 9,560 r.p.m. driven by E.C.C. squirrel cage motor through speed increasing gear box by David Brown Ltd., and Vulcan Sinclair fluid coupling. A somewhat unorthodox decision was made to install the machines out of doors with-

out any form of cover, only the electrical control gear being housed. Those parts of the machines which were likely to be adversely affected by being exposed to the atmosphere were to be specially weatherproofed. Other special features included heating of the oil for the fluid coupling by fitting an electric immersion heater in the sump. In this way upwards of £10,000 would be saved, without detriment to the efficient working of the plant by eliminating the traditional compressor houses.

Any scheme for integrating the ten works in No. 2 Division would obviously have to be considered as part of a much larger system of integration covering the whole of the Central Area. This area includes the City of Birmingham and the City of Coventry, together with other important towns. About 71% of the total gas made by the West Midlands Board is distributed in the Central Area which is predominately industrial, and is contained in an area of about 1,100 square miles, approximately equal to the area of the North Thames Gas Board, with an annual output in 1955-56 of over 53,000 mill. cu.ft., greater than the individual outputs of seven of the 12 area boards. The Central Area grid is an amalgamation of the divisional grids of the Wolverhampton, Walsall, Birmingham and Coventry Divisions. Each was designed separately in such a way that on completion it would fit properly into its allotted place in the Central Area grid. The possibility of a Lurgi high-pressure grid is being kept in mind which will be superimposed on the Divisional and local grids and inject gas into them at strategic points.

Formidable Difficulties

The Wolverhampton and District Division is geographically smaller in area than any of the seven divisions of the West Midlands Gas Board, but it has the second largest distribution system, 1,234 miles of main, and the second largest number of consumers, 182,000. The practical difficulties of laying large diameter mains through such a heavily built up area are very formidable, and the cost of such work very high. The permanent pressure survey had established the necessity for new low presure trunk mains in the Willenhall and Bilston areas. Should the new integration system be used to reinforce district pressures through governors where necessary along its route, or should integration mains be laid direct from works to works with no supplies taken off en route? If the latter was adopted, large diameter low pressure feeder mains would have to be laid in addition to grid mains, to reinforce district pressures in the two towns mentioned. It was decided to lay a single 'spine' main along a route which would enable the maximum use to be made of it for reinforcing district pressures in the areas through which it passed, while at the same time providing a means of transferring substantial volumes of gas between the ten works in existence at the time. An existing 18-in. main from Bilston works to the north-east of the Bilston area tested for high pressure transmission, was taken over for use as a grid main to save cost, but except for this the 'spine' main, from the boundary between the Walsall and Wolverhampton Division east of Willenhall, through the Division to a point two miles south of Dudley, would be 24 in. Since demands for gas would shortly outstrip the capacity of existing and projected manufacturing plant, and several manufacturing stations were scheduled to be closed down, further reducing the manufacturing capacity, supplies would have to be imported from outside the Division. These supplies would be either from a new works in Willenhall or from the new Walsall plant, via the James Bridge holder station. It was ultimately decided that the Walsall plant would be the main source of imported gas so a major connection with the Walsall divisional grid, connecting with the Birmingham system, was projected. This took the form of a 24-in. branch, through a 20-in. volumetric governor with a maximum capacity of 1 mill. cu.ft. per hour, together with a Connersville meter of .5 mill. cu.ft. per hour capacity, allowance being made for a second meter which it was anticipated would eventually be required. It is estimated that up to 1 mill. cu.ft. per hour could be imported from the Walsall Division at the present maximum initial pressure of 7 p.s.i. When completed the total capacity of compressing plant connected to the grid in No. 2 Division will be over 3 mill. cu.ft. per hour including standby plant. In addition 18 district governors and ten volumetric governors are connected direct to the grid.

Means have been provided in the system whereby gas can be either imported into a district or exported from the same district by compressing plant at the works. This applies to Wolverhampton, Bilston, Dudley, Stourbridge and Tipton, and it was deemed advisable that the gas imported or exported should be controlled volumetrically. Replies to inquiries for a volumetric governor which would pass gas in controlled volumes either way through a single governor showed that efforts to design such a governor had proved unsuccessful. Duplicate governors, one for each direction of flow, were suggested, or alternatively that a system of valves and connections should be provided to enable the direction of flow to be reversed, but with the flow always being in the same direction through the governor. After a considerable amount of thought a basic design for a two-way volumetric governor was suggested to the Jeavons Engineering Co., Ltd., who considered it to be a practical proposition to develop their standard 'Emco' volumetric governor along the lines suggested. A line diagram of the arrangement and operation of the governor is shown in Fig. 2.

Limiting Devices

The supply into the comparatively small holder stations at Willenhall, Brierley Hill, Cradley Heath and Halesowen is controlled by standard one-way Jeavons 'Emco' volumetric governors. In each case, districts are supplied through district governors installed along the route of the supply main, and to ensure adequate inlet pressures to these governors, inlet pressure limiting devices are fitted to the volumetric governors which cause the latter to close at a pre-determined low inlet pressure of 1 p.s.i. These single-way volumetric governors serve as a non-return valve also, and preserve holder stocks for district use by preventing the draining of the holders back along the supply main.

The integrating of the ten works in the Wolverhampton and District Division, together with the connections with Walsall and Kidderminster, has involved the laying of 55,000 yards of main, ranging in size from 10-in. to 27-in. Mainlaying has been along traditional lines using

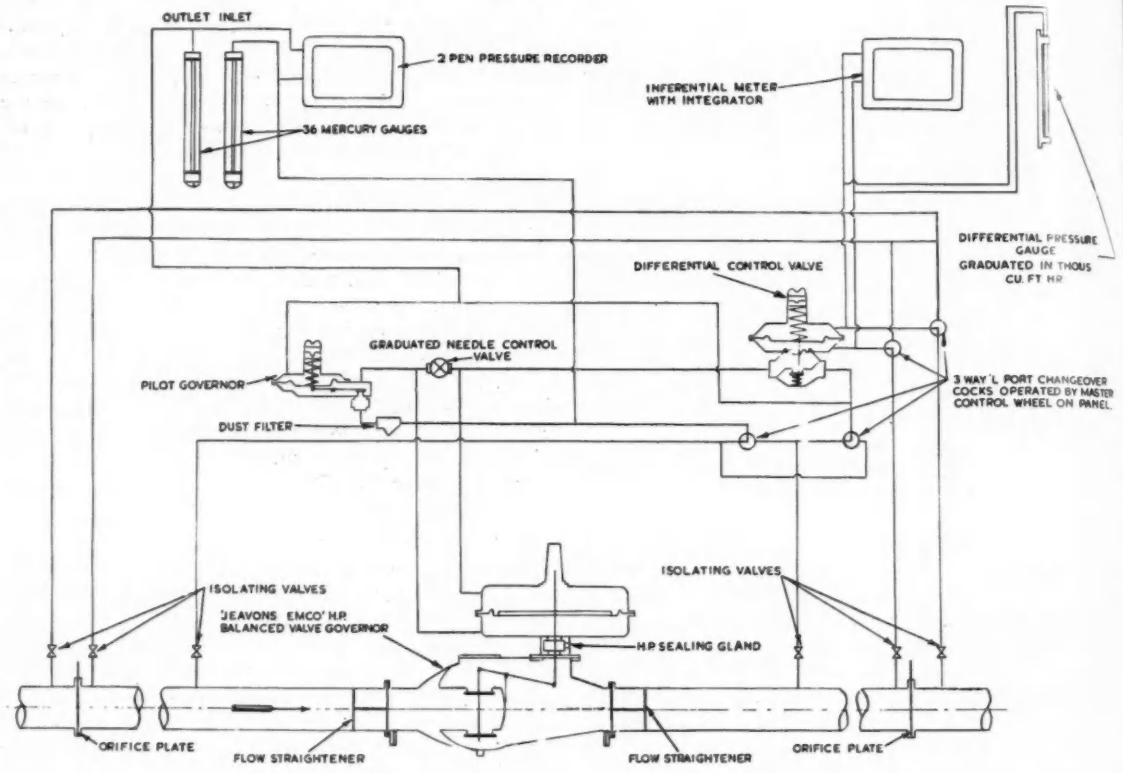


Fig. 2. The general lay-out for a modified Jeavons Emco h.p. governor for reversable gas flow.

mainly spun iron pipes, but there are two points connected with this work which are probably worthy of special comment, one of which concerns the testing of the pipeline and the other the laying of prestressed concrete pipes. It was originally intended that the whole of the pipeline should be tested to 50 p.s.i. by air pressure using the White tester, and this method was used until an incident occurred during the testing of a short length of 18-in. pipe. Due to a fault in a timber baulk used for strutting an end cap, movement of the end pipe occurred to the point where the last two pipes were completely displaced with rather alarming effect. Fortunately the incident took place within one of the works and no one was injured. To prevent a recurrence of the incident, which in a built-up area might have most serious consequences, it was decided to test all high pressure pipelines in such areas for mechanical soundness hydraulically to 40 p.s.i., followed by an air test to 20 p.s.i. The wisdom of this change was shown when subsequently a 24-in. spun iron pipe failed under hydraulic test. An 18-ft. long 24-in. pipe was found to have a 14-ft. longitudinal split. This occurred in a built-up area and one can only guess what the effect would have been had the main been under test at 50 p.s.i. air pressure. The tolerance allowed for the hydraulic tests was that used by most water authorities, viz., a loss of 1 gal. of water per 1-in. diameter of main, per mile of main under test, per 24 hours per 100 ft. head test pressure.

It was necessary to lay part of the integration main between Bilston and the Walsall Division along a canal towpath for some 2,300 yards. The alternative and most direct route passed through the heavily built-up area of Willenhall which rendered the laying of 24-in. mains practically impossible. The main had to be laid in the towing path below water level and it was known that the canal water was aggressively corrosive since it received the discharge of industrial waste from a number of steel processing works which were using pickling solutions. Although they used neutralising tanks, the water contained sulphur and other chemicals. Analyses were made of the canal water and the subsoil of the towing path. The latter was also found to be corrosive containing coal outcrops with a high salt content. Some pipe protective measures were therefore necessary. The use of bitumen sheathed spun iron pipes were considered which would have been cheaper than bitumen sheathed steel pipes, and later the possibility of surrounding the main with concrete. This led to the idea of using the pre-stressed concrete pipes, manufactured by the Stanton Ironworks Co. Ltd., under licence from the Lock Joint Pipe Co. of America. Discussions with the technical branch of the Stanton Ironworks Co. Ltd. led to the decision to use 27-in. pre-stressed concrete pipes which were the smallest size available at the time. These pipes consist of a 16 gauge welded steel cylinder, to which are welded socket and spigot ends made from aluminised steel. The steel cylinder with its sockets and spigot ends which form the patent Lock joint, is tested hydraulically to 50 p.s.i. The cylinder is then lined centrifugally with a mixture of 4½:1 granite chips and

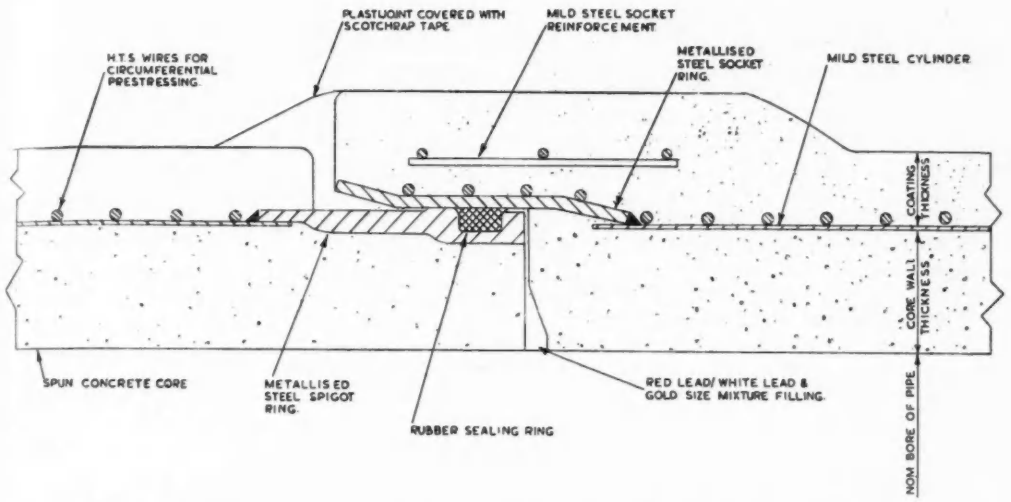

PLASTIJOINT COVERED WITH SCOTCHRAP TAPE
MILD STEEL SOCKET REINFORCEMENT
METALLISED STEEL SOCKET RING.
MILD STEEL CYLINDER
HTS WIRES FOR CIRCUMFERENTIAL PRESTRESSING.
COATING THICKNESS
CORE WALL THICKNESS
NOM BORE OF PIPE
SPUN CONCRETE CORE
METALLISED STEEL SPIGOT RING.
RUBBER SEALING RING
RED LEAD/WHITE LEAD & GOLD SIZE MIXTURE FILLING.

Fig 3. Detailed construction of a prestressed concrete main, and Stanton lock joint.

cement to a thickness of 1 1/16 in. Stressing wire of 100/110 tons per sq. in. steel and .2-in. diameter, is wound under tension on the outside of the steel cylinder-leaving the wire stressed to 70/75 tons per sq. in. The pitch of the wires is arranged according to the duty required, and in this case for pipes for a working pressure of 200 ft. head the pitch was 1½ in. The pipe is then subjected to a hydraulic test of 300 ft. head of water. The outside of the pipe is covered with a mixture of 2½:1 sand and sulphate resisting cement 1¼ in. thick, The whole pipe is then cured for approximately 12 hours at 140/150°F. Fig. 3 shows a section through the joint and the general construction of the pipe. The transporting of the pipes, which were 15 ft. long and weighed 2¼ tons each, to the trench side was a problem which was solved by delivering them by road to a number of selected points, and loading on to a specially prepared motor barge which delivered them to the trench side.

There were six road bridges crossing the canal which had to be negotiated and, due to the narrowness of the towpath passing under these bridges, the main had to pass through the main structure. Since the only pre-stressed concrete specials available were short knuckle bends, it was necessary to change from pre-stressed concrete to cast iron so that cast iron specials could be used. This was achieved by using a special matching piece with a Lock joint spigot at one end and a bolted gland socket at the other, as shown in Fig. 4, which also shows the provision made for the collection of condensate. The cost of 24-in. syphons is high and the accommodation required not inconsiderable. It was thought that the amount of condensate would not be great and, therefore, a dip pipe was fitted as shown. A 2.-in drain pipe was also fitted which could be connected to a side syphon if this was found in practice to be necessary. The main was tested in sections as laid to 30 p.s.i.g. air pressure, the average drop over

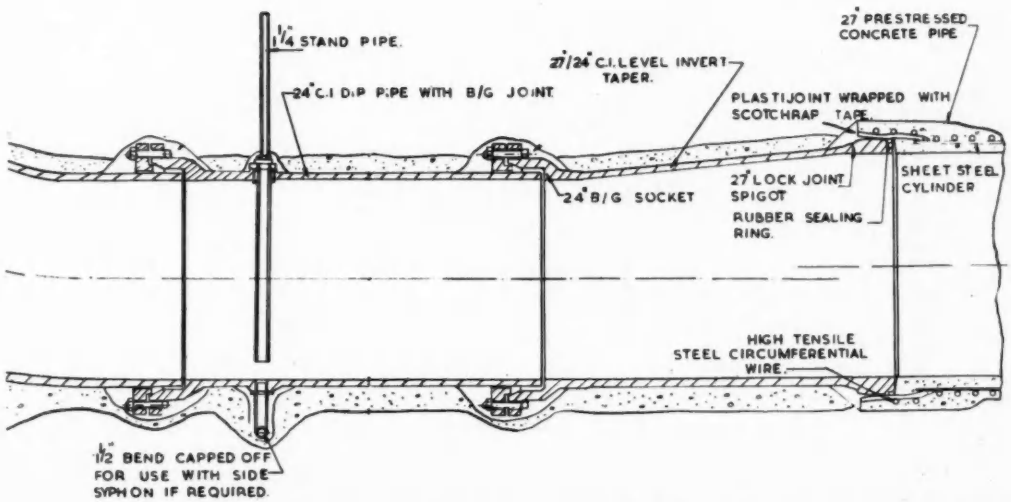

1¼" STAND PIPE.
27"/24" C.I. LEVEL INVERT TAPER.
27" PRESTRESSED CONCRETE PIPE
24" C.I. DIP PIPE WITH B/G JOINT
PLASTIJOINT WRAPPED WITH SCOTCHRAP TAPE.
SHEET STEEL CYLINDER
24" B/G SOCKET
27" LOCK JOINT SPIGOT
RUBBER SEALING RING.
HIGH TENSILE STEEL CIRCUMFERENTIAL WIRE.
½" BEND CAPPED OFF FOR USE WITH SIDE SYPHON IF REQUIRED.

Fig. 4. The method by which the 27-in. prestressed concrete main is joined to the 24-in. cast iron main. Note protection of the cast iron section.

24 hours being .038 p.s.i. So far as is known this is the first time pre-stressed concrete pipes have been used for gas transmission, not only in this country but in the world. It is not claimed that for normal practice these pipes will replace the more traditional methods, but the experiment has proved that where special circumstances arise the use of these pipes is a practical proposition.

The Grid system described is no copybook integration schem in the form of isolated bulk supply mains between undertakings, a system which lends itself to comparatively easy methods of control. The multiplicity of district governors supplied by the grid, there are 18 of them, together with the constant changes in the direction of flow of gas in the grid main, governed largely by consumer demand, make day to day control more difficult than is the case in the more orthodox direct station to station systems. In broad and general terms the works with surplus gas pump their surplus into the grid, and works with a deficiency in requirements take gas from the grid either into holders direct through volumetric governors, or partly into their districts through district governors, with the balance taken through relief governors into holders, generally during the time when district demands have fallen off. A weekly programme, which is circulated to the persons directly concerned, is agreed. Requirements and surpluses are decided by the Divisional Production Engineer in conjunction with the Headquarters Central Control Office. The methods by which supplies are transmitted to the required points are the responsibility of the Divisional Distribution Engineer. A detailed log is kept on which is recorded pressure conditions throughout the length of the grid main, pressures on the inlet and outlet of each district governor, volumes delivered into and volumes withdrawn from the grid, together with boosting and compressing periods and pressures.

A very important part of the operation of any Grid system is the regular maintenance of the plant connected to it. A scheme has, therefore, been instituted whereby all volumetric governors, district governors, holder relief governors and non-return valves connected to the grid receive regular attention by mobile governor mechanics. The auxiliary systems in these items of plant are overhauled every three months, while a complete overhaul including dismantling of main governors, is carried out every 12 months. This work is carried out by a two-man gang using a small fully equipped mobile workshop which is fitted with radio for use in emergency. Maintenance of instruments is at present done under contract by the manufacturers on a three monthly basis. It is, however, intended that the governor mechanics shall be trained to the point where they will be capable of carrying out routine instrument maintenance.

BOOK REVIEW

The Scaling-up of chemical plant and processes

THE report on the proceedings of the joint symposium on the scaling-up of Chemical Plant and Processes, held in London in 1927, has been published by the Institution of Chemical Engineering.

The symposium was sponsored by the Chemical Engineering Group of the Royal (Netherlands) Institute of Engineers, the section for Chemical Technology of the Royal Netherlands Chemical Association, the Chemical Engineering Group of the Society of Chemical Industry and the Institution of Chemical Engineers; a total of 13 papers was presented.

The scaling-up of plant of every description has now become of great importance to almost every branch of industry owing to the widespread trend to concentrate production in larger and larger units. The problems to be met when a process has been successfully established in the laboratory and is to be translated to industrial practice are well known. The method of first experimenting on an intermediate scale in pilot plants has grown in importance in the last few decades, so also has the need for increasing the size of existing plants to produce greater quantities without multiplying the number of units of proved efficiency.

Such developments must be carefully carried out since success at the pilot plant stage or with small full-scale plants, does not necessarily guarantee that all problems have been solved. The reverse, however, may be true, if sufficient courage and funds enable a full-scale plant to be built after only partial success at the intermediate stages. An example of this, given in the report, is the success of the electrolytic smelting of aluminium ores.

The increasing interest of the gas industry in chemical engineering is shown by the recent developments in large ancillary plants and the new high pressure gas production processes using oil or small coal as a feedstock. The papers presented at the symposium covered a wide range of subjects, many of which were of interest to the carbonising industries. Included were papers on the economic aspects of scaling-up chemical plants, the scaling-up of reactors from a knowledge of kinetics, experiments with furnace models, and model tests with cyclones. The symposium was divided up into four sessions, after each of which, the papers presented were discussed.

The report, published by the Institute of Chemical Engineers, 16, Belgrave Square, London, S.W.1, costs £2, post free, to members of the sponsoring bodies; otherwise, £3, post free.

Safety B.S. Amended

SINCE the publication last year of B.S. 2929, the British Standard on safety colours for use in industry, the attention of B.S.I. has been drawn to the fact that use of a green cross, as recommended in the standard, to indicate first-aid goods and equipment might possibly be considered as an infringement of certain registered trade marks.

To avoid any risk of confusion the standard is therefore being amended. It will now recommend that location of first-aid equipment should be indicated by the use of the words 'First Aid' printed in bold white capital letters on a green rectangular background.

Two U.S. scrubbers now on U.K. market

THE Chemico Pease-Anthony gas scrubbing equipment is the outcome of more than 20 years' research and extensive pilot plant and field testing.

Both types—the cyclonic scrubber and the newer venturi scrubber—are being successfully used in a wide range of industries in the U.S.A. for the removal of micron and sub-micron dusts, fumes, mists and fogs from gas streams.

The apparatus is equally effective for the reduction of air pollution and for cleaning industrial gases. It also enables valuable metals and chemicals to be recovered.

In the cyclonic scrubber dirty gas enters tangentially at the bottom of the scrubber and pursues a spiral path upwards. Spray is introduced into rotating gas from an axially-located manifold in the lower part of the unit.

The fine spray droplets are caught in the gas stream and by centrifugal force are swept across to the wall of the cylinder, colliding with and collecting the dust particles en route. The water and collected dust run down the walls and out at the bottom of the unit.

The cyclonic scrubber is well suited to the removal of dusts and mists of micron size when it will give very high removal efficiencies often above 99%, with small pressure losses and consequently low power requirements.

The water requirements are low, normally between 4 and 8 imp. gal. per 1,000 cu.ft. of cleaned gas, the actual quantity varies with the dust particle size and inlet gas temperature. No moving parts are used and corrosion-resistant materials virtually eliminate maintenance problems.

Among the many applications for which the cyclonic scrubber has been installed involving over 100 units and 3 mill. cu.ft. per min. of gas, is the removal of lime dust from lime kiln gases, the recovery of lead compounds from reverberatory furnaces and the removal of ammonium nitrate from rotary dryer gases.

In the venturi scrubber dirty gas at high velocity impinges upon and atomises a curtain of liquid introduced through jets at the throat of the venturi. Differential velocities of gas and atomised liquid result in collision of mist or dust particles with liquid droplets. The coalescence of mist or agglomeration of dust resulting from this collision make simple cyclonic separation possible.

The venturi scrubber is claimed to be efficient and economical for the most difficult scrubbing jobs, assuring almost complete removal of sub-micron dust and mist. High temperatures present no difficulties while the use of corrosion-resistant materials and lack of moving parts results in very small maintenance costs.

The venturi scrubber has been applied to more than 50 different gas cleaning problems involving over 200 units handling a total of over 5 mill. cu.ft. per min. of gas.

Examples of the applications to which the scrubber has been put are the removal of fume and iron oxide dust from blast furnace and oxygen steel converter gases, amine recovery from dry ice and CO_2 plants, the removal of phosphoric and sulphuric acid mists from concentrators, and of naphthalene, coke and tar from coke oven gas, and chemical fumes from detergent spray dryers.

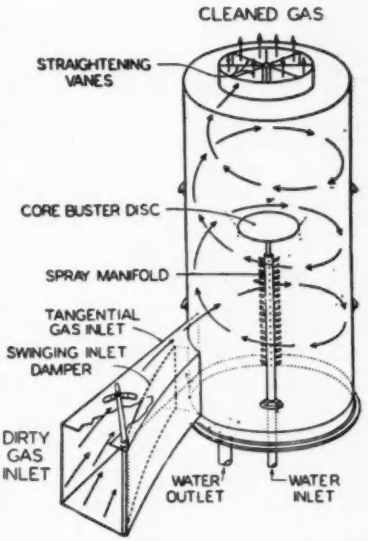


Diagram of the Chemico Pease-Anthony cyclonic scrubber.

It is expected that chemical manufacturers concerned with the Clean Air Act, the Alkali Act and work regulations will be particularly interested in this equipment as well as industries concerned with the recovery of valuable chemicals and metals.

Recently negotiated licensing arrangements with the Chemical Construction Corporation of New York, world licensees for these patented scrubbers, have made possible their availability in this country through *Chemical Construction (G.B.), Ltd., Henrietta House, 9, Henrietta Place, London, W.1.*

TRADE NEWS

The Chemico Pease-Anthony venturi scrubber.

Improved Saffire welding gear

SINCE the Saffire range of welding and cutting equipment was first introduced by British Oxygen Gases, Ltd., in 1956, certain design improvements have been perfected. They have been made to increase its operating efficiency and the ease with which its components can be interchanged.

The equipment can be used for welding, cutting, gouging, heating and flame cleaning, and the outfit is supplied with all attachments or with one head, as required.

To facilitate the conversion of existing equipment to the New Type 2 the Company has introduced special arrangements under its 'Service Exchange' scheme. This enables existing components to be modified at a nominal charge.—*British Oxygen Gases Ltd., Spencer House, St. James's Place, S.W.1.*

International Metalock Conference

THE Metalock system of carrying out cold repairs to fractured castings is becoming increasingly well-known in all branches of light and heavy industry, and in land, sea and air transport, both in this country and throughout the world.

Each year a conference of delegates from the member companies is held in the home country of one of the members, and the 1958 conference was held in Italy, the home of Metalock (Italiana) S.A.

A completed Metalock repair may be compared to a medical suture. It consists of inserting a number of metal stitches across a crack or fracture. Each stitch comprises a row of holes with narrow channels cut between them, and bonding metal—in a form known as 'keys'—is inserted into the resultant cavities. One or all of the company's repair techniques may be employed, according to the nature of the fracture, the techniques being known as the 'Metalock,' 'Metalace' and 'Masterlock' processes.

In every case, the parts of the fractured metal are first restored to precise —but not necessarily their original— alignment. Then, if the repair is a 'Metalock' one, rows of blind pilot holes are drilled in the parent metal, transversely to the fracture as surgical stitches cross an incision, a jig being used to ensure correct spacing. These pilot holes are opened out, and a channel of metal is removed between adjacent holes by the use of a gun tool, to provide more or less parallel rows of interconnected holes.

'Metalock' keys made of specially prepared metal, and shaped to fit these hole-and-channel cavities, are driven into each cavity by a pneumatic hammer, one on top of the other, and are subsequently peened so that the keys and joined sections of metal are practically integrated. The strength of the repair depends on the total number of keys inserted—a number calculated with regard to the thickness of the metal and the proximity of the stitches.

In the 'Metalace' process, tangent holes are drilled and tapped along the line of fracture, and studs are cold worked into the holes after Metalock keys have been inserted in the manner described. This ensures the complete filling of the crack with new metal.

The 'Masterlock' technique consists of a combination of the foregoing process with the insertion of blocks of new metal across the fracture at a depth less than the thickness of the parent metal. The blocks are held in place by keys bridging the parent and new metal, and studs worked into holes between them and the parent metal, half of each hole being in each piece of metal to be joined.

Blocks are inserted at points of high stress concentration, or in sections subject to overloading and to the risk of subsequent failure. The keys are made from a highly ductile, high-tensile, heat-resisting alloy with an expansion coefficient similar to that of the casting.—*Metalock (Britain) Ltd., 638, Grand Buildings, Trafalgar Square, London, W.C.2.*

NEW PORTABLE CONTINUOUS BURNING FIRE

A PORTABLE continuous burning fire is being added to their range of Redfyre heating appliances by Newton Chambers & Co., Ltd. Requiring absolutely no fixing, it can be bought by the householder and simply placed in position.

The design was specially commissioned from the industrial designer, Brian Asquith, and is neatly contemporary. Named the Redfyre 60, the new fire is also available in a standard (non-portable) design. Both models are available to the trade immediately.

The fire has a vitreous enamelled cast iron front and is obtainable in an attractive new off-white as well as in light cream mottle, blend mottle, black, black lustre and copper lustre. The ashes door fits slimly recessed beneath the rest of the grate and adjusts for air control. A removable deepening bar, operating tool and mild steel ashpan are supplied. The Redfyre 60 is suitable for burning any solid fuel, and has a strong 30% chrome steel heat-resistant cantilevered bottom grate, reversible for coal or coke.

Standard, concealed or portable gas ignition is available as an optional extra and also a plain cast safety plate for overnight burning.

The portable Redfyre 60 costs from £4 16s. to £5 6s.; the standard, £4 6s. to £4 16s.—*Newton Chambers & Co., Ltd., Thorncliffe, Sheffield.*

Improved diesel hydraulic loader

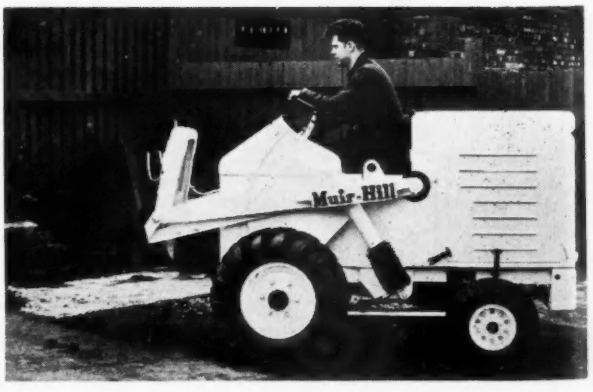
A NEW model of the Muir-Hill LH-1 diesel hydraulic loader has been introduced. A new engine, the Perkins P3 (144), which is of more compact design and which incorporates unified screw threads, replaces the former P3 engine. In addition, improved weight distribution and better access to the gear box and clutch has been obtained by the movement of the engine 3¼ in. to the rear without lengthening the chassis.

A much cleaned-up appearance has been obtained by using a radiator of lower height which has enabled the engine cover to be lowered by 4 in. and by the restyling of the front of the machine. This last alteration has also resulted in considerably improved vision for the operator. In addition, the beam guides have been removed and the front panel and buffer have been integrated by the use of $\frac{3}{16}$ in. plate.

Another important alteration is that the selector is now positioned at the right hand rear of the driver on the main frame, which results in a considerable shortening of hydraulic circuits and provides a much neater hydraulic system layout, increased cockpit room and easier servicing.

The overall width of the machine is reduced by 4 in. by the use of a narrower steering axle to line up the steering wheels with the driving wheels. The lifting beams have been extended by 4 in. to allow for provision for a cross-member, and this results in an increased lift to 5 ft. 3 in. under lip of tipped bucket at minimum tipping angle and an increased reach of 3 ft. 10 in.

All the best points of the former model are retained. The LH-1 loader is intended for all types of industrial bulk material handling jobs. Manœuvrability and the fact that it can work in the same space as a man, coupled with its economy of operation, ease of maintenance and reliability are claimed to ensure lower working costs.—*E. Boydell & Co., Ltd., Old Trafford, Manchester, 16.*



The new Muir-Hill LH-1 loader provides much improved vision.